Claims

SUB B1

1. Structural component (1) made out of fibre-reinforced thermoplastic plastic material, characterized by a shaping, long-fibre-reinforced (LF) thermoplastic matrix (2) and an integrated load-bearing supporting structure (4) consisting of consolidated continuous fibre strands (CF) (3) with a thermoplastic matrix, whereby the long-fibre matrix and the continuous fibre matrix are compatible to such an extent, that they at their mutual interfaces (6) are fused together, resp., thermoplastically bonded and whereby the continuous fibre strands (3) of the supporting structure (4) have at least one load-transmitting internal connecting area (7) of two continuous fibre strands.

2. Structural component in accordance with claim 1, characterized in that the interfaces (6) at least partially are designed as connecting layers (6a), which form a transition zone between long-fibre matrix (2) and continuous fibre strands (3).

3. Structural component in accordance with claim ~~1 or 2~~ 1, characterized in that the interfaces (6) are designed as structured interfaces having uneven shapings (6b).

4. Structural component in accordance with ~~one of the preceding claims~~ claim 1, characterized in that the continuous fibre strands (CF) of the supporting structure form at least one closed mesh (10).

5. Structural component in accordance with ~~one of the preceding claims,~~ Claim 1 characterized in that the continuous fibre strands run in different directions and are thermoplastically bonded together at internal load-transmitting connecting areas (7) in the manner of a framework.

6. Structural component in accordance with ~~one of the preceding claims,~~ Claim 1 characterized in that the matrix material of the long-fibre reinforcement (2) and of the continuous fibre strands (3) in preference is identical, at least, however, compatible to such an extent, that the two materials are mixable together at the interfaces (6) through diffusion.

7. Structural component in accordance with ~~one of the preceding claims,~~ Claim 1 characterized in that the matrices of the long-fibre-reinforcement (2) and of the continuous fibre strands (3) consist of polypropylene (PP), polyamide (PA), polyethylenetherephtalate (PET), polybutylene-therephtalate (PBT), thermoplastic polyurethanes (PUR), polycarbonate (PC), polyacrylics, polyimide (PI), polyphenylsulphide (PPS) or polyetheretherketone (PEEK) and that the reinforcing fibres (13) of the continuous fibre strands in preference consist of glass, carbon or aramide and the long-fibre reinforcement (12) preferably consists of glass.

8. Structural component in accordance with claim 1, characterized in that the reinforcement (12) of the long-fibre matrix has a fibre content of 15 - 25 % by volume and that the continuous fibre strands (13) have a fibre content of at least 40 %, in preference 45 - 60 % by volume.

9. Structural component in accordance with claim 1, characterized in that the continuous fibre strands are twisted (15).

10. Structural component in accordance with claim 1, characterized in that the continuous fibre strands are needle-bonded (18), wrapped (16) or enveloped by a braided (17) tube.

11. Structural component in accordance with claim 1, characterized in that the long-fibre reinforcement (12) has a great proportion of fibres with a length of at least 5 mm, whereby the fibre length preferably to a great extent is within a range of 10 - 30 mm.

12. Structural component in accordance with claim 1, characterized in that load-bearing inserts (21) (e.g., seat-belt anchoring points) are integrated, which are directly connected with the continuous fibre strands (3), resp., are surrounded by them.

13. Structural component in accordance with claim 1, characterized in that further inlays (22) are integrated, e.g., high-strength continuous fibre-reinforced tubular profile parts (23) and / or local continuous fibre fabric inlays (24), which are connected with the continuous fibre strands and fused together with the long-fibre matrix.

14. Structural component in accordance with claim 1, characterized in that the continuous fibre strands form „three-dimensional" profile cross sections (25, 26, 27).

15. Structural component in accordance with claim 1, characterized in that external connecting areas (8) of the continuous fibre strands are foreseen.

16. Structural component in accordance with claim 1, characterized in that the layer thickness (d3) of the continuous fibre strands (3) is at least as great as the layer thickness (d2) of the long-fibre matrix (2) located above it.

17. Structural component in accordance with claim 1, characterized in that the load-transmitting connecting areas are designed with a large surface area (F7).

18. Structural component in accordance with claim 1, characterized in that the connecting areas (7) have a thin long-fibre intermediate layer (9).

19. Structural body (90) consisting of at least two structural components (1) in accordance with claim 1, which structural components are in preference connected to one another at external connecting areas (8) of the continuous fibre strands.

20. Structural body with at least two structural components (1) in accordance with claim 1, which are designed as half-shells and are connected to one another and, e.g., in the form of a U-profile (92) together with a cover (93) form a hollow profile girder (91).

21. Method for the manufacturing of a structural component in accordance with claim 1, characterized in that a plastified, long-fibre-reinforced plastic mass (2) is laid corresponding-to-form into an open, two-part form tool (51) in a

press and that within the same cycle before and/or after the feeding-in of the long-fibre-reinforced mass (2) by means of a laying device (54) or of a transfer device (55) a preformed supporting structure (4a) with internal connecting areas (7) made of consolidated, plastified continuous fibre strands (3) is laid in the tool and formed or formed outside and transferred into the tool and by means of fixing means is held in place to such an extent, that with the pressing and closing of the form tool a desired supporting structure (4) of the continuous fibre strands (3) is produced and whereby with the pressing a thermoplastic bonding at the interface (6) between the long-fibre mass (2) and the continuous fibre strands (3) is produced.

22. Method in accordance with claim 21, characterized in that first the continuous fibre strands (3) are laid along a predefined laying path (39) into the lower mould half (51.1), thereafter the long-fibre-reinforced mass (2) is fed-in onto it and then the pressing takes place.

23. Method in accordance with claim 21, characterized in that the continuous fibre strands (3) for the forming of the preformed supporting structure (4a) are laid onto a transport mesh (31), fixed on it and subsequently transferred into the open form tool (51).

24. Method in accordance with claim 23, characterized in that first the long-fibre-reinforced mass (2) is laid into the form tool, thereafter the transport mesh (31) with the continuous fibre strands (3) is transferred into the open form tool and finally the pressing takes place.

25. Method in accordance with claim 21, characterized in that first the preformed supporting structure (4a) is formed and cooled down to such an extent, that it is non-deformable, subsequently transferred to the tool, fixed and if so required superficially heated up to such an extent, that during pressing it is completely thermoplastically bonded with the long-fibre mass (2).

26. Method in accordance with claim 21, characterized in that first a first partial structure (4.1) made of continuous fibre strands is fixed in the tool, then the long-fibre mass (2) is fed in and pressed, subsequently heated up again and a second partial structure (4.2) made of continuous fibre strands is fed-in and with a second pressing process completely thermoplastically bonded.

27. Method in accordance with claim 26, characterized in that first continuous fibre strands (3.1) forming a partial structure (4.1) are laid into the lower mould half (51.1), thereafter the long-fibre mass (2) is fed-in and a first pressing takes place, whereupon press and form tool are opened again, on the long-fibre mass (2) a laying path for a second layer of continuous fibre strands is melted open on the surface by means of local heating, continuous fibre strands (3.2) forming a second partial structure (4.2) are laid on it and subsequently pressed and in doing so thermoplastically bonded with the long-fibre mass (2).

28. Method in accordance with claim 21, characterized in that first the beginning (3A) of a continuous fibre strand is fixed on the tool, subsequently laid under slight tension and its end (3E), again while maintaining a certain tension, is fixed on the form tool (51), e.g., by means of tensioning elements (80).

29. Method in accordance with claim 21, characterized in that several continuous fibre strands (3) with internal connecting areas, resp., cross-over areas (7) are laid one after the other, so that a framework-like supporting structure (11) is produced.

30. Method in accordance with claim 21, characterized in that the continuous fibre strands (3) are pressed onto the mould by the laying device (54) dosed in such a manner, that the strands lie flat and assume the desired position and cross-sectional shape in the form tool. (51).

31. Method in accordance with claim 21, characterized in that the continuous fibre strands (3), resp., the supporting structure (4) are at least partially, i.e., at the beginning (3A), at directional changes of the laying path and at the end (3E) melted (41) onto the mould.

32. Method in accordance with claim 21, characterized in that the continuous fibre strands (3) through contact with the cooler form tool (51) are solidified to such an extent, that they remain fixed during pressing and that they in doing so, however, on the other hand at their interfaces (6) completely fuse together again with the long-fibre mass (2).

33. Method in accordance with claim 21, characterized in that at least at the beginning (3A) and end (3E) or also within a continuous fibre strand in molten condition eyes (43) for fixation are melted-in by pressing and partial solidifying and that these formed ends (3A, 3E) after the laying of the continuous fibre strand (3) are superficially melted open again by the hot long-fibre molten mass.

34. Method in accordance with claim 21, characterized in that at least at the ends (3A, 3E) or also within the melted open continuous fibre strands holding elements (45) with plug-in holes (46) are melted open, which during the laying of the hot long-fibre mass (2) fuse together with it.

35. Installation (50) for the implementation of the method in accordance with claim 21, characterized by a long-fibre plastifying - and feeding device (52), a two-part form tool (51) in a press (56) and a continuous fibre strand plastifying device (53) with a laying device (54) or a transfer device (55) assigned to it as well as with a control system (57) for the co-ordinated in time controlling of the movement of the installation components and for the temperature conditioning, for the laying of the continuous fibre strands (3), resp., for the formation of a preformed supporting structure (4a) with internal connecting areas (7) and for the corresponding-to-form feeding-in of the long-fibre molten mass (2) as well as for the thermoplastic bonding (6) of continuous fibre strands (3) and long-fibre matrix (2) as well as by assigned fixing means (61, 62, 66, 69, 75, 80) for the fixation of the continuous fibre strands (3) during the manufacturing process, so that the desired integrated supporting structure (4) results.

36. Installation in accordance with claim 35, characterized in that fixing - and tensioning elements like fixing pins (61) and deviating elements (62) for the continuous fibre strands are located on the lower half of the form tool (51.1).

37. Installation in accordance with claim 36, characterized in that the fixing pins and deviating elements are movable (63) and when the press (56) is closed are pushed against a pre-tensioning (65) by the upper mould half (51.2).

38. Installation in accordance with claim 36, characterized in that the fixing pins have a controlled drive (64) and are utilizable for removing the component from the mould.

39. Installation in accordance with claim 36, characterized in that the fixing - and tensioning elements (61, 80) are attached outside the structural component (1) to be manufactured, but inside the form tool (51).

40. Installation in accordance with claim 35, characterized in that the tool has shapings like channels (66) and steps (67), with which the laid continuous fibre strands (3) are held in place during pressing.

41. Installation in accordance with claim 40, characterized in that the shapings, i.e., the laying paths (39) in the tool are thermally insulated (73), resp., conditioned (74).

42. Installation in accordance with claim 35, characterized in that the laying device (54) has guiding -, shaping - and pressing-on means, e.g., in the form of guide rollers (68) and pressure rollers (69).

43. Installation in accordance with claim 35, characterized in that a transport mesh (31) is foreseen for the laying of the continuous fibre strands of the supporting structure (4a) with an inlay mesh (32) in a transfer frame (33) for the transfer into the press, whereby the inlay mesh (32) after the pressing is integratable into the structural component (1) and the transfer frame is provided with a new inlay mesh for the next cycle.

44. Installation in accordance with claim 35, characterized in that a consolidation device (58) is assigned for the continuous fibre strands.

45. Installation in accordance with claim 35, characterized in that a heated store (59) for the continuous fibre strands is foreseen, from which the cut-to-length consolidated continuous fibre strands (3) are taken, melted open and utilized for the formation of the supporting structure (4a).

46. Installation in accordance with claim 35, characterized in that a hot gas - and/or a protective gas conditioning (71) are/is foreseen.